Dans le cadre des conférences Foton-ENSSAT aura lieu le 17 décembre 2009 14 h - 15 h
un séminaire présenté par Frédéric Grillot, Foton-INSA.

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Séminaire Foton-ENSSAT, 17 décembre 2009 14 h salle 137 C

« Role of the Linewidth Enhancement Factor in the Optical Feedback Instabilities of Quantum Dash/Dot Devices »

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Résumé :

The dramatic variation in the linewidth enhancement factor (α_H–factor) that has been reported for quantum dash/dot (QD) lasers makes them an interesting subject for optical feedback studies. A low α_H–factor combined with a high damping factor is especially interesting because it should increase the tolerance to optical feedback in these devices and may offer potential advantages for direct modulation. In the particular case of QD lasers, the carrier density is not clearly clamped at threshold. The lasing wavelength can switch from the ground state (GS) to the excited state (ES) as the current injection increases meaning that a carrier accumulation occurs in the ES even though lasing in the GS is still occurring. The filling of the ES inevitably enhances the α_H–factor of the GS above threshold. This strong variation of the GS α_H–factor in comparison to QW devices, has found to produce a significant variation in the laser's feedback sensitivity. One method to investigate the tolerance to optical feedback is to look at the variation in the onset of coherence collapse due to feedback. This coherence collapse regime, in which the laser is subject to instabilities, is incompatible with data transmission because of the induced high penalty bit-error rate. Another method is to look at the small signal transfer function, which can strongly suffer from large deviations both in the amplitude and the phase response due to optical feedback. Finally, several unique advantages of QD materials, such as ultra broad bandwidth, ultra fast gain dynamics, and easily saturated gain and absorption make them an ideal choice for semiconductor monolithic mode-locked lasers. In some practical situations related to the generation of optical pulses using a monolithic approach, the mode-locked laser could experience optical feedback generated by discrete reflections. The presentation will also investigate the effects of optical feedback on the performance showing that feedback levels greater than 25-dB can cause severe modifications to the mode-locking conditions.

Frédéric Grillot was born in Versailles (France), on August 22, 1974. He received the M.Sc. degree in Physics from Dijon University in 1999 and the Ph.D. degree in Electrical Engineering from Besançon University in 2003. His doctoral research activities were conducted within the optical component research department in Alcatel. Along his PhD, Dr. Grillot studied the effects of the optical feedback in semiconductor lasers, and the impact this phenomenon has on optical communication systems for high bite rate transmissions. From May 2003 to August 2004, he was working with the Institut d'Electronique Fondamentale (University of Paris-Sud) where he focused on integrated optics modelling and on Si-based passive devices for optical interconnects and telecommunications. On September 1st 2004, he has been appointed to the Institut National des Sciences Appliquées de Rennes (INSA) where he is currently working as an Associate Professor within the Materials and Nanotechnologies (MNT) department. His main research activities are on advanced laser diodes emitting at 1.55-µm using new materials like quantum dots for low-cost applications. Since beginning of 2008 he is also a Visiting Research Professor of Electrical and Computer Engineering at the University of New-Mexico, USA. He is leading Research in optical science and optoelectronics at the Center for High Technology Materials (CHTM). Dr. Grillot is a Member of IEEE-Photonics Society and la Société Française d'Optique.